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THE REFUTATION OF NUMBER THEORY I

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Theorien kommen und gehen,
Tatsachen bleiben.
R. W. Pohl

Constitution of the canonical system $\mathfrak{K}_0$ for a finitary interpretation of intuitionistic 'deduction' by imperative 'derivation'

0.1 $\longrightarrow {}_k0$; 0.2 ${}_kw \longrightarrow {}_{k'}w$;;

1.1 $\longrightarrow {}_x\xi$; 1.2 ${}_xw \longrightarrow {}_{x'}w$;;

2.1 $\longrightarrow {}_{*k}0$; 2.2 ${}_{*k}w \longrightarrow {}_{*k'}w$; 2.3 ${}_xw \longrightarrow {}_{*k}w$;;

3.1 ${}_{*k}w_1, {}_{*k}w_2 \longrightarrow {}_A{}^{=}w_1w_2$;

3.2,3 ${}_{*k}w_1, {}_{*k}w_2, {}_{*k}w_3 \longrightarrow {}_A{}^{+}w_1w_2w_3, {}_A{}^{\times}w_1w_2w_3$;

3.4,5 $\longrightarrow {}_A\vee, {}_A\wedge$;

3.6,7,8 ${}_Au_1, {}_Au_2 \longrightarrow {}_A{}^{\rightarrow}u_1u_2, {}_A{}^{\wedge}u_1u_2, {}_A{}^{\vee}u_1u_2$;

3.9,10 ${}_xv, {}_Au \longrightarrow {}_A{}^{\vee}vu, {}_A{}^{\wedge}vu$;;

4.1,2 ${}_xw \longrightarrow {}_\downarrow\xi{}'w, {}_\downarrow{}'w\xi$; 4.3 ${}_\downarrow vw \longrightarrow {}_\downarrow{}'v{}'w$;

4.4,9,10 ${}_xw \longrightarrow {}_\downarrow w0, {}_\downarrow w\vee, {}_\downarrow w\wedge$; 4.5 ${}_\downarrow vw \longrightarrow {}_\downarrow v'w$;

4.6,11,12,13,14,15 ${}_\downarrow vw_1, {}_\downarrow vw_2 \longrightarrow {}_\downarrow v^{=}w_1w_2, {}_\downarrow v^{\rightarrow}w_1w_2, {}_\downarrow v^{\wedge}w_1w_2,$
$, {}_\downarrow v^{\vee}w_1w_2, {}_\downarrow v^{\vee}w_1w_2, {}_\downarrow v^{\wedge}w_1w_2$;

4.7,8 ${}_\downarrow vw_1, {}_\downarrow vw_2, {}_\downarrow vw_3 \longrightarrow {}_\downarrow v^{+}w_1w_2w_3, {}_\downarrow v^{\times}w_1w_2w_3$;

4.16,17 ${}_xv, {}_Aw \longrightarrow {}_\downarrow v^{\vee}vw, {}_\downarrow v^{\wedge}vw$;;

5.1 ${}_xv, {}_{*k}w \longrightarrow {}_\parallel vvww$; 5.2 ${}_\downarrow vu, {}_{*k}w \longrightarrow {}_\parallel vuwu$;

5.3 ${}_\parallel vuv_1u_1 \longrightarrow {}_\parallel v'uv_1{}'u_1$;

5.4,7,8,9 ${}_\parallel wuw_1u_1, {}_\parallel wvw_1v_1 \longrightarrow {}_\parallel w^{=}uvw_1{}^{=}u_1v_1, {}_\parallel w^{\rightarrow}uvw_1{}^{\rightarrow}u_1v_1,$
$, {}_\parallel w^{\wedge}uvw_1{}^{\wedge}u_1v_1, {}_\parallel w^{\vee}uvw_1{}^{\vee}u_1v_1$;

5.5,6 ${}_\parallel vv_1ww_1, {}_\parallel vv_2ww_2, {}_\parallel vv_3ww_3 \longrightarrow {}_\parallel v^{+}v_1v_2v_3w^{+}w_1w_2w_3,$
$, {}_\parallel v^{\times}v_1v_2v_3w^{\times}w_1w_2w_3$;

5.10,11 ${}_\downarrow vw_1, {}_\downarrow vw, {}_\parallel wuw_1u_1 \longrightarrow {}_\parallel w^{\vee}vuw_1{}^{\vee}vu_1, {}_\parallel w^{\wedge}vuw_1{}^{\wedge}vu_1$;;

6.1,11,12 $_{A}u \longrightarrow {}_{D}{<}_{\infty\to} uu, {}_{D}{<}_{\infty\to} u\vee, {}_{D}{<}_{\infty\to}\wedge u;$

6.2 $_{D}{<}u_1u_2{\to}uw, {}_{D}{<}v_1v_2{\to}wv \longrightarrow {}_{D}{<}{<}u_1u_2{\to}uw{<}v_1v_2{\to}wv{\to}uv;$

6.3,4,6,7 $_{A}u, {}_{A}v \longrightarrow {}_{D}{<}_{\infty\to}{\wedge}uvu, {}_{D}{<}_{\infty\to}{\wedge}uvv,$

$, {}_{D}{<}_{\infty\to} u^{\vee}uv, {}_{D}{<}_{\infty\to} v^{\vee}uv;$

6.5 $_{D}{<}u_1u_2{\to}wu, {}_{D}{<}v_1v_2{\to}wv \longrightarrow {}_{D}{<}{<}u_1u_2{\to}wu{<}v_1v_2{\to}wv{\to}w^{\wedge}uv;$

6.8 $_{D}{<}u_1u_2{\to}uw, {}_{D}{<}v_1v_2{\to}vw \longrightarrow {}_{D}{<}{<}u_1u_2{\to}uw{<}v_1v_2{\to}vw{\to}{}^{\vee}uvw;$

6.9 $_{D}{<}w_1w_2{\to}{\wedge}wuv \longrightarrow {}_{D}{<}_{o}{<}w_1w_2{\to}{\wedge}wuv{\to}w{\to}uv;$

6.10 $_{D}{<}w_1w_2{\to}w{\to}uv \longrightarrow {}_{D}{<}_{o}{<}w_1w_2{\to}w{\to}uv{\to}{\wedge}wuv;$

6.13,15 $_{x}v, {}_{*k}v_1, {}_{A}u, {}_{\|}vuv_1u_1 \longrightarrow {}_{D}{<}_{\infty\to}u_1{}^{\vee}vu, {}_{D}{<}_{\infty\to}{\wedge}vuu_1;$

6.14 $_{x}v, {}_{\nmid}vw, {}_{D}{<}w_1w_2{\to}uw \longrightarrow {}_{D}{<}_{o}{<}w_1w_2{\to}uw{\to}{}^{\vee}vuw;$

6.16 $_{x}v, {}_{\nmid}vw, {}_{D}{<}w_1w_2{\to}wu \longrightarrow {}_{D}{<}_{o}{<}w_1w_2{\to}wu{\to}w{}^{\wedge}vu;$

6.17 $_{x}v, {}_{A}u, {}_{\|}vu'vu_1, {}_{\|}vu0u_2, {}_{D}{<}w_1w_2{\to}uu_1 \longrightarrow {}_{D}{<}_{o}{<}w_1w_2{\to}uu_1{\to}u_2u;$

6.18,19,20,21 $\longrightarrow {}_{D}{<}_{\infty\to}{\vee}{=}00, {}_{D}{<}_{\infty\to}{=}\xi'\xi{=}'\xi''\xi,$

$, {}_{D}{<}_{\infty\to}{=}'\xi''\xi{=}\xi'\xi, {}_{D}{<}_{\infty\to}{\vee}{=}'\xi0{=}0'\xi{\wedge};$

6.22,23 $\longrightarrow {}_{D}{<}_{\infty\to}{\vee}{\wedge}{=}''\xi0{=}'''\xi\xi -$

$- \vee''''\xi\vee''''\xi\vee''''''\xi\wedge\wedge\wedge{=}\xi''''\xi{=}'\xi''''''\xi{=}''\xi''''''\xi{+}''''\xi''''''\xi''''''\xi{+}\xi'\xi''\xi,$

$, {}_{D}{<}_{\infty\to}{+}\xi'\xi''\xi\vee{\wedge}{=}'\xi0{=}'''\xi\xi -$

$- \vee''''\xi\vee''''\xi\vee''''''\xi\wedge\wedge\wedge{=}\xi''''\xi{=}'\xi''''''\xi{=}''\xi''''''\xi{+}''''\xi''''''\xi''''''\xi;$

6.24,25 $\longrightarrow {}_{D}{<}_{\infty\to}{\vee}{\wedge}{=}'\xi0{=}''\xi0 -$

$- \vee''''\xi\vee''''\xi\vee''''''\xi\wedge{=}\xi''''\xi\wedge{=}'\xi''''''\xi\wedge{+}''''''\xi\xi''\xi{\times}''\xi''''''\xi''''''\xi{\times}\xi'\xi''\xi,$

$, {}_{D}{<}_{\infty\to}{\times}\xi'\xi''\xi\vee{\wedge}{=}'\xi0{=}''\xi0 -$

$- \vee''''\xi\vee''''\xi\vee''''''\xi\wedge{=}\xi''''\xi\wedge{=}'\xi''''''\xi\wedge{+}''''''\xi\xi''\xi{\times}''\xi''''''\xi''''''\xi.$

7.1.1,2 $\longrightarrow {}_{U_0}0 \vee {}^{=}00$, ${}_{U_0}0 \wedge {}^{='}00$; 7.1.3 ${}_{*k}w_1$, ${}_{*k}w_2 \longrightarrow {}_{U_0}0 {}^{=}w_1 w_2 {}^{=}w_1 w_2$;

7.1.4,5 ${}_{*k}w_1$, ${}_{*k}w_2$, ${}_{*k}w_3 \longrightarrow {}_{U_0}0 {}^{+}w_1 w_2 w_3 {}^{+}w_1 w_2 w_3$, ${}_{U_0}0 {}^{\times}w_1 w_2 w_3 {}^{\times}w_1 w_2 w_3$;

7.2.1 ${}_{U_0}wuu_1 \longrightarrow {}_{U}wuu_1$; 7.2.2 ${}_{U}wuu_1 \longrightarrow {}_{U'}wu {}^{\Rightarrow}{\circ}u_1$;

7.1.6,8,10 ${}_{U_0}wuu_1$, ${}_{U}wvv_1 \longrightarrow {}_{U_0'}w {}^{\rightarrow}uv {}^{\Rightarrow}u_1 v_1$, ${}_{U_0}w {}^{\wedge}uv {}^{\wedge}u_1 v_1$, ${}_{U_0}w {}^{\vee}uv {}^{\vee}u_1 v_1$;

7.1.7,9,11 ${}_{U}wuu_1$, ${}_{U_0}wvv_1 \longrightarrow {}_{U_0'}w {}^{\rightarrow}uv {}^{\Rightarrow}u_1 v_1$, ${}_{U_0}w {}^{\wedge}uv {}^{\wedge}u_1 v_1$, ${}_{U_0}w {}^{\vee}uv {}^{\vee}u_1 v_1$;

7.1.12,13 ${}_{x}v$, ${}_{U_0}wuu_1 \longrightarrow {}_{U_0}w {}^{\vee}vu {}^{\vee}vu_1$, ${}_{U_0'}w {}^{\wedge}vu {}^{\wedge}vu_1$;;

8.1 $\longrightarrow {}_{\cup *k}0{\circ}$; 8.2 ${}_{*k}v$, ${}_{\cup *k}wu \longrightarrow {}_{\cup *k'}w {}^{\cup}uv$;;

4.18,19,20,21 $\longrightarrow {}_{\nmid}{\circ}\infty$, ${}_{\nmid}{\circ}0$, ${}_{\nmid}{\circ}\vee$, ${}_{\nmid}{\circ}\wedge$; 4.22,23 ${}_{x}w \longrightarrow {}_{\nmid}{\circ}w$, ${}_{\nmid}w{\circ}$;

4.24 ${}_{\nmid}wu$, ${}_{\nmid}wv \longrightarrow {}_{\nmid}w {}^{\cup}uv$; 4.25 ${}_{\nmid}uw$, ${}_{\nmid}vw \longrightarrow {}_{\nmid}{}^{\cup}uvw$;

4.26 ${}_{\nmid}vu_1$, ${}_{\nmid}vu_2 \longrightarrow {}_{\nmid}v {}^{\Rightarrow}u_1 u_2$; 4.27,28 ${}_{x}v$, ${}_{U_0}wuu_1 \longrightarrow {}_{\nmid}v {}^{\vee}vu_1$, ${}_{\nmid}v {}^{\wedge}vu_1$;;

5.12 ${}_{\nmid}{\circ}u \longrightarrow {}_{\parallel}{\circ}u{\circ}u$; 5.13 ${}_{\parallel}vuv_1u_1$, ${}_{\parallel}wu_1w_1u_2 \longrightarrow {}_{\parallel}{}^{\cup}vwu {}^{\cup}v_1 w_1 u_2$;

5.14 ${}_{\parallel}wvw_1v_1$, ${}_{\parallel}wuw_1u_1 \longrightarrow {}_{\parallel}w {}^{\Rightarrow}vuw_1 {}^{\Rightarrow}v_1 u_1$;;

9.1 $\longrightarrow {}_{\smile}{\circ}\infty{\circ}$; 9.2 ${}_{x}v$, ${}_{\smile}u{\circ}w$, ${}_{\nmid}vu \longrightarrow {}_{\smile}{}^{\cup}uv{\circ}{}^{\cup}wv$;

9.3 ${}_{x}v$, ${}_{\smile}u_1u_2u$, ${}_{\nmid}vu_1$, ${}_{\nmid}vu_2 \longrightarrow {}_{\smile}u_1 {}^{\cup}u_2 v {}^{\cup}uv$;

9.4 ${}_{x}v$, ${}_{\smile}u_1u_2u$, ${}_{\smile}{}^{\cup}w_1vw_2u_1$, ${}_{\nmid}{}^{\cup}w_1vw_2$, ${}_{\nmid}vu_2 \longrightarrow {}_{\smile}u_1 {}^{\cup}u_2 vu$;;

10.1 ${}_{x}v$, ${}_{\nmid}vu \longrightarrow {}_{-}uvu$; 10.2 ${}_{x}v$, ${}_{\smile}{}^{\cup}w_1vw_2u$, ${}_{\smile}w_1w_2w$, ${}_{\nmid}{}^{\cup}w_1vw_2 \longrightarrow {}_{-}uvw$;;

11.1,2 $\longrightarrow {}_{\smile|}\infty$, ${}_{\smile|}{\circ}0$; 11.3 ${}_{\smile|}vw \longrightarrow {}_{\smile|}v'w$; 11.4 ${}_{x}v \longrightarrow {}_{\smile|}{}^{\cup}{\circ}vv$;

11.5 ${}_{\cup *k''}0^{\cup\cup}{\circ}w_1w_2$, ${}_{\smile|}v_1w_1$, ${}_{\smile|}v_2w_2$, ${}_{\smile}v_1v_2v \longrightarrow {}_{\smile|}v {}^{=}w_1w_2$;

11.6,7 ${}_{\cup *k'''}0^{\cup\cup\cup}{\circ}w_1w_2w_3$, ${}_{\smile|}v_1w_1$, ${}_{\smile|}v_2w_2$, ${}_{\smile|}v_3w_3$, ${}_{\smile}v_1v_2u$, ${}_{\smile}uv_3v \longrightarrow$

$\longrightarrow {}_{\smile|}v {}^{+}w_1w_2w_3$, ${}_{\smile|}v {}^{\times}w_1w_2w_3$;

11.8,9,10 ${}_{\smile|}v_1u_1$, ${}_{\smile|}v_2u_2$, ${}_{\smile}v_1v_2v \longrightarrow {}_{\smile|}v {}^{\wedge}u_1u_2$, ${}_{\smile|}v {}^{\vee}u_1u_2$, ${}_{\smile|}v {}^{\Rightarrow}u_1u_2$;

11.11,12 ${}_{x}v$, ${}_{\smile|}v_1u$, ${}_{-}v_1vw \longrightarrow {}_{\smile|}w {}^{\vee}vu$, ${}_{\smile|}w {}^{\wedge}vu$;;

12.1,3,6 $\longrightarrow {}_{-d}{}^{\vdash}{}_{\circ\circ}{}^{=}00_{\circ}, {}_{-d}{}^{\vdash}{}_{\circ\circ}{}^{+}000_{\circ}, {}_{-d}{}^{\vdash}{}_{\circ\circ}{}^{\times}000_{\circ};$

12.2 ${}_{-d}{}^{\vdash}{}_{\circ}v^{=}w_1w_2{}_{\circ} \longrightarrow {}_{-d}{}^{\vdash}{}_{\circ}{}^{\vdash}{}_{\circ}v^{=}w_1w_2{}_{\circ}{}^{='}w_1{}'w_2{}_{\circ};$

12.4 ${}_{-d}{}^{\vdash}{}_{\circ}v^{+}w_10w_3{}_{\circ} \longrightarrow {}_{-d}{}^{\vdash}{}_{\circ}{}^{\vdash}{}_{\circ}v^{+}w_10w_3{}_{\circ}{}^{+'}w_10{}'w_3{}_{\circ};$

12.7 ${}_{-d}{}^{\vdash}{}_{\circ}v^{\times}w_10w_3{}_{\circ} \longrightarrow {}_{-d}{}^{\vdash}{}_{\circ}{}^{\vdash}{}_{\circ}v^{\times}w_10w_3{}_{\circ}{}^{\times'}w_10w_3{}_{\circ};$

12.5 ${}_{-d}{}^{\vdash}{}_{\circ}v^{+}w_1w_2w_3{}_{\circ} \longrightarrow {}_{-d}{}^{\vdash}{}_{\circ}{}^{\vdash}{}_{\circ}v^{+}w_1w_2w_3{}_{\circ}{}^{+}w_1{}'w_2{}'w_3{}_{\circ};$

12.8 ${}_{-d}{}^{\vdash}uv^{\times}w_1w_2w_{\circ}, {}_{-d}{}^{\vdash}{}_{\circ}v_1{}^{+}ww_1w_3{}_{\circ} \longrightarrow$

$\longrightarrow {}_{-d}{}^{\vdash}{}^{\vdash}uv^{\times}w_1w_2w_{\circ}{}^{\vdash}{}_{\circ}v_1{}^{+}ww_1w_3{}_{\circ}{}^{\times}w_1{}'w_2w_3{}_{\circ};$

13.1 ${}_{-d}u \longrightarrow {}_{d}u;$ 13.9 ${}_{d}{}^{\vdash}u_1u_2uw \longrightarrow {}_{d}{}^{\vdash}{}_{\circ}{}^{\vdash}u_1u_2uw{}^{\Rightarrow}{}_{\circ}u_{\circ};$

13.2,3 ${}_{U_\circ}wuu_1, {}_{U}wvv_1, {}_{d}{}^{\vdash}u_2u_3u_1w_1, {}_{d}{}^{\vdash}v_2v_3v_1w_2 \longrightarrow$

$\longrightarrow {}_{d}{}^{\vdash}{}^{\vdash}u_2u_3u_1w_1{}^{\vdash}v_2v_3v_1w_2{}^{\wedge}u_1v_{1\circ}, {}_{d}{}^{\vdash}{}^{\vdash}v_2v_3v_1w_2{}^{\vdash}u_2u_3u_1w_1{}^{\wedge}v_1u_{1\circ};$

13.4,6 ${}_{U_\circ}wuu_1, {}_{U}wvv_1, {}_{\smile|}{}_{\circ}v_1, {}_{d}{}^{\vdash}u_2u_3u_1w_1 \longrightarrow {}_{d}{}^{\vdash}{}_{\circ}{}^{\vdash}u_2u_3u_1w_1{}^{\vee}u_1v_{1\circ},$

$, {}_{d}{}^{\vdash}{}_{\circ}{}^{\vdash}u_2u_3u_1w_1{}^{\vee}v_1u_{1\circ};$

13.5,7 ${}_{U_\circ}wuu_1, {}_{U}wvv_1, {}_{\smile|}{}_{\circ}u_1, {}_{d}{}^{\vdash}v_2v_3v_1w_2 \longrightarrow {}_{d}{}^{\vdash}{}_{\circ}{}^{\vdash}v_2v_3v_1w_2{}^{\vee}v_1u_{1\circ},$

$, {}_{d}{}^{\vdash}{}_{\circ}{}^{\vdash}v_2v_3v_1w_2{}^{\vee}u_1v_{1\circ};$

13.8 ${}_{U_\circ}wuu_1, {}_{\smile|}{}^{\cup}{}_{\circ}vu_1, {}_{k}w_1, {}_{\|}vu_1w_1u_2, {}_{d}{}^{\vdash}v_1v_2u_2w_2 \longrightarrow {}_{d}{}^{\vdash}{}_{\circ}{}^{\vdash}v_1v_2u_2w_2{}^{\vee}vu_1w_1;$

13.10 ${}_{D}{}^{\angle}w_1w_2w_3, {}_{U_\circ}ww_3{}^{\Rightarrow}vu, {}_{\smile|}v_1{}^{\Rightarrow}vu, {}_{\cup^*k}v_3v_1, {}_{\cup^*k}v_3u_1, {}_{\smile|}{}_{\circ}u_1,$

$, {}_{\|}v_1{}^{\Rightarrow}vuu_1{}^{\Rightarrow}v_2u_2 \longrightarrow {}_{d}{}^{\vdash}{}^{\angle}w_1w_2w_3{}_{\circ}{}^{\Rightarrow}v_2u_2u_1;$

13.11 ${}_{d}{}^{\vdash}u_1u_2{}^{\Rightarrow}{}_{\circ}uw \longrightarrow {}_{d}{}^{\vdash}{}^{\vdash}u_1u_2{}^{\Rightarrow}{}_{\circ}uw_{\circ}u_{\circ};$

13.12 ${}_{d}{}^{\vdash}u_1u_2{}^{\Rightarrow}vuw, {}_{d}{}^{\vdash}v_1v_2vw_1 \longrightarrow {}_{d}{}^{\vdash}{}^{\vdash}u_1u_2{}^{\Rightarrow}vuw{}^{\vdash}v_1v_2vw_1u_{\circ};$

13.13 ${}_{d}{}^{\vdash}v_1v_2{}^{\wedge}vuw, {}_{k}w_1, {}_{\|}vuw_1u_1 \longrightarrow {}_{d}{}^{\vdash}{}^{\vdash}v_1v_2{}^{\wedge}vuw_{\circ}u_1w_1.$

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